

PD-202097

VIDEO ON DEMAND IN A BROADCAST NETWORK

Stephen P. Dulac

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present invention is cross-referenced to pending U.S. Application Serial Number 09/491,959, filed January 26, 2000, entitled VIRTUAL VIDEO ON DEMAND USING MULTIPLE ENCRYPTED VIDEO SEGMENTS.

TECHNICAL FIELD

[0002] The present invention relates generally to a method for video on demand services in a broadcast network with digital video recorders and more particularly to delivering on demand video in segments over more than one delivery session.

BACKGROUND OF THE INVENTION

[0003] Broadcast networks having digital video recorders provide video services that allow subscribers to order programs. A subscriber typically accesses a program library and requests a desired program. Typically, the requested program is delivered to a digital video recorder (DVR) at the subscriber location and recorded for viewing over a predetermined period of time.

[0004] Near video on demand (NVOD) service offers programs which a subscriber can choose to purchase and view at a predetermined time. The programs have regular start times, for example every half-hour, and a subscriber enjoys the purchased program at scheduled times. NVOD services have hardware based encryption methods applied to the digital broadcast signal, making them difficult to defeat, thereby limiting access to the programming to purchasers only. Impulse pay per view (IPPV) programming is another type of NVOD but allows a subscriber to purchase the program using their remote control.

[0005] Video on demand (VOD) service provides a subscriber with virtually instantaneous access to the program for viewing. The customer doesn't have to wait for a scheduled start time before viewing the program. For customers with a DVR, the VOD service can be offered by delivering a collection of programs a priori, or without a specific request, to a subscriber's DVR and then offering those programs for purchase and viewing upon the subscriber's demand virtually independent of a scheduled viewing time.

[0006] However, the added advantage of purchasing and watching a program without having to request the program in advance is not without significant drawbacks. The subscriber's DVR has limited storage capacity and therefore, the quantity of programs stored on the DVR is limited to the DVR's available storage capacity. Therefore, to store all available programming choices results in unpurchased and unwanted programming being unnecessarily stored on the customer's DVR.

[0007] Another drawback associated with video on demand service is the security risk associated with delivering and storing the program content. Typically, the program content stored on the DVR is encrypted using software based encryption methods. A hacker can defeat the software based encryption methods of the stored programs, increasing the risk that the program content may be accessed without actually being purchased. Yet another drawback is the need to store the encrypted data on the DVR. For many VOD applications, a DVR must have the capability to store encrypted video, which is a feature that not all DVR's possess. This severely limits the availability of VOD services.

[0008] There is a need to provide VOD services while maintaining the security and wide variety of available program content associated with NVOD services.

SUMMARY OF THE INVENTION

[0009] The present invention enables VOD services for a subscriber from existing NVOD services while reducing the storage requirements on the subscriber's DVR and lowering the risk that the program content may be accessed without being purchased. The subscriber is making a selection from a program library for viewing upon demand without having to wait for scheduled viewing times. The video is provided on demand as a portion of the program is previously stored on the DVR and is available for immediate viewing. The remaining portion is delivered and stored on the DVR, commencing while the subscriber is viewing the previously stored segment.

[0010] The present invention is a video on demand service enabled from a near video on demand service. A desired program is split into portions, or clips. The first clip is delivered a priori to the customer's DVR and it is made available for purchase on demand. The remaining portion, which may be a clip or clips, is broadcast regularly using the start time of the NVOD service, for as long as the program is available for VOD purchase.

[0011] An object of the present invention is to reduce the storage requirements in the limited storage capacity of a subscriber's DVR. It is another object of the present invention to reduce the risk that the video on demand content may be accessed without being purchased. It is still another object of the present invention to use systems and methods already in place for NVOD services, IPPV services, and other network directed recordings, without the need for additional investment in order to provide VOD services.

[0012] Other objects and advantages of the present invention will become apparent upon reading the following detailed description and appended claims, and upon reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] For a more complete understanding of this invention, reference should now be made to the embodiments illustrated in greater detail in the accompanying drawings and described below by way of examples of the invention. In the drawings:

[0014] FIGURE 1 is a block diagram of a video on demand service provided by a satellite broadcast network provider using a DVR;

[0015] FIGURE 2 is a diagram of the portions, or clips, of the video program; and

[0016] FIGURE 3 is a flow chart of the method of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0017] The present invention is described herein with reference to Figures 1 and 2. Figure 1 is a block diagram of a satellite broadcast network system 10 and is used for example purposes to describe one embodiment of the present invention. It should be noted that the present invention is not limited to satellite broadcast networks and one skilled in the art is capable of applying the present invention to other broadcast network providers without departing from the scope of the present invention.

[0018] The headend system 12 has a broadcast playout system 14 that contains the program content broadcast by the network system 10. Services 15 available from the broadcast playout system 14 are processed before uplink to a satellite 28 for broadcast. The program content contains the programs available for on demand purchase by a subscriber, or customer. The on demand program content is sectioned into at least two portions, clip A 16 and clip B 18.

[0019] A scheduling and guide system 20 contains the data about the program content that is to be made available to the subscriber for on demand purchase. The scheduling and guide system 20 provides services metadata 22,

such as the interactive program guide to a processing module 24, where the data is encrypted, multiplexed, modulated and sent, by way of antenna 26, as an uplink to at least one satellite 28.

[0020] A conditional access system 30 processes and controls the data from the scheduling and guide system 20 and a customer business system 32, to provide conditional access metadata, such as entitlement control messages (ECM's) and entitlement management messages (EMM's), that are sent to the processing module 24 for encryption, multiplexing, modulating and uplink to the satellite 28.

[0021] At a remote subscriber location, there is a digital video recorder (DVR) 38 that is typically an integrated receiver/decoder (IRD) having digital video storage 36 capability, where the signals from the satellite 28 are received, usually by way of antenna 40, decoded and displayed on a video monitor 42. The signal broadcast from the satellite is received at the DVR 38 where it is demodulated and demultiplexed. The DVR need not have the capability to store encrypted video data in order to benefit from the VOD services of the present invention.

[0022] According to one embodiment of the present invention, a program portion, clip A 16, of the available on-demand program content, is broadcast and stored on the digital video recorder 38. Upon purchase by a subscriber, the remainder of clip B 18 is sent to the DVR 38 for playback and recording. At any time after purchase, the purchase data 44 is sent to the headend system 12.

[0023] The first clip, clip A 16, is delivered a priori to the subscriber's DVR 38 in a manner that is hidden to the subscriber. The first clip is not stored as encrypted data on the DVR, but is either sent unencrypted, or sent as encrypted data and decrypted before being stored on the DVR. In either

scenario, the first clip is stored on the DVR as unencrypted data, removing the necessity for the DVR to have the capability to store encrypted data.

[0024] Clip A 16 is sent individually using a predetermined channel, such as a “hidden channel”, and then broadcast separately at another time, such as during the middle of the night. A “hidden channel” is a channel that is not displayed to a customer viewing the program guide, so there is no desire for a customer to tune to that particular channel. In this regard, a clip may be delivered on a channel that is not readily apparent to a customer, but is known to the receiver.

[0025] Because only a portion of the program, Clip A, is stored on the DVR 38, there is far less incentive for a hacker to attempt to “steal” the program for viewing.

[0026] A receiver management function 46 in the DVR 38 is responsible for deciding, based on received metadata, when it is appropriate to capture clip A 16 for a VOD program. It should be noted that a plurality of clip A’s 16 from a variety of VOD programs may be bundled together for delivery to the DVR 36.

[0027] Conditional access control determines if the DVR is entitled to receive clip A 16 from the broadcast network. For example, if announced separately, clip A 16 may be received by a DVR 38 that has active DVR service, or some other service subscription level authorizing the receipt of clip A 16. A part of the NVOD broadcast, an ECM in the conditional access metadata 34, might indicate that decryption of clip A 16 is allowed by DVR’s with active DVR service. A DVR feature authorizer and service verification function 48 is responsible for deciding, based on received metadata, when decryption of clip A 16 is allowed.

[0028] The length of clip A is nominally equal to the intervals between start times of the NVOD service. However, it may be greater or it could be less.

If greater in length, multiple predetermined transition points are provided, allowing improved probability of a proper seamless transition from clip A to a succeeding clip, clip B 18 for example. If the length of clip A is shorter than the interval between start times, then the system may be introducing a period where the service may not be truly "on demand." However, the storage capacity demand of the DVR is still reduced.

[0029] The subsequent clip, Clip B 18, in the present example, must contain at least the remainder of the program. The subsequent clip, Clip B 18, may include the content provided in Clip A 16. Clip B 18 may contain the entire program for the purpose of NVOD broadcasts that serve non-DVR receivers as well. The DVR can present the VOD program for purchase to the subscriber. Clip B 19 may also include additional bonus content.

[0030] Referring to Figure 2, an example of the division of the program 50 into Clip A 16 and Clip B 18 is shown. The length of clip A is measured from the program start 52. If clip A is longer than the start interval 56, thirty minutes in the present example, predetermined transition points 58A, 58B, and 58C are identified in Clip B. The end of Clip A is after the last predetermined transition point 58C of Clip B. The end 54 of the VOD program 50 coincides with the end of Clip B 18.

[0031] A subscriber will be able to use DVR functions such as fast forward and reverse. In the event that less than all the remaining program has been received and decrypted at the receiver, the subscriber will only be able to fast forward to the point that has at least been delivered. The result to the customer may be similar to what they would experience when attempting to fast forward through a "live" television broadcast.

[0032] Referring now to Figure 3, a flow chart of the method 100 of the present invention is herein described. Clip A is delivered 102 and Clip A 16 is stored 104 as unencrypted data on the hard disk drive of the DVR. Clip B 18 is

regularly broadcast 106, for example, with the scheduled NVOD broadcast. The VOD program is offered 108 for purchase. The offer may include additional information about the program such as movie reviews and additional description.

[0033] Promotional videos and “free” previews are other examples of additional bonus content that may be presented. The subscriber purchases 110 the VOD program and the DVR is authorized 112 to decrypt Clip B. The authorization may be from the IPPV mechanism for example. The DVR then schedules resources to begin capture and decryption 114 of the next available Clip B from the broadcast. Clip B is also stored as unencrypted data on the DVR. Once the next available Clip B broadcast has begun, the subscriber begins to play the program using Clip A stored on the DVR and the DVR switches 116 to clip B at the appropriate time. The customer is unaware of the transition and enjoys the remainder of the program uninterrupted.

[0034] The complete purchase of the program consists of Clip A and Clip B and then remains available on the DVR for additional playbacks in accordance with the rules set by the network operator for deletion. The DVR may continue to store Clip A and Clip B in their entirety and perform the switching between each clip upon each playback, or the DVR may splice the clips together and delete any overlap of the two clips after storage. The program need not be stored as encrypted data and is available for playback at any time within the network operator’s rules. The purchase data is transferred in a known method, such as telephone, cable modem, high-speed connection, or wireless method, to the network operator for billing purposes.

[0035] The seamless switching from Clip A to Clip B is accomplished using triggers in the broadcast data. For example, the triggers would be delivered with the video in a form such as vertical blanking interval or MPEG data, or in the alternative, the triggers may be included with the services

metadata. In any event, the delivery of triggers with the video requires additional processing prior to the broadcast to insert the triggers at the predetermined transition points. The DVR notes matching triggers and effects the switching from Clip A to Clip B using the output switch 49 function.

[0036] The invention covers all alternatives, modifications, and equivalents, as may be included within the spirit and scope of the appended claims.